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—THE—  
**Canadian Architect and Builder,**  
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PUBLISHED MONTHLY IN THE INTEREST OF  
ARCHITECTS, CIVIL AND SANITARY ENGINEERS, PLUMBERS,  
DECORATORS, BUILDERS, CONTRACTORS, AND MANU-  
FACTURERS OF AND DEALERS IN BUILDING  
MATERIALS AND APPLIANCES.

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**SUBSCRIPTIONS.**

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**EDITOR'S ANNOUNCEMENTS.**

Contributions of technical value to the persons in whose interests this journal is published, are cordially invited. Subscribers are also requested to forward newspaper clippings or written items of interest from their respective localities.

*The Ontario Association of Architects has appointed the "Canadian Architect and Builder" its official paper.*

**M**R. W. WEBSTER'S experiments at Crossness, for treating the sewage of London with a view to its purification by electricity have so far been successful that the London City Council has engaged an electrical engineer to watch the undertaking in its behalf, and over 11,000 tons of lime and sulphate of iron have been ordered for use in carrying on the new method.

**I**T gives us pleasure to see the Hamilton City Council waking up to the necessity of providing the citizens with a number of easily accessible parks. Hamilton and Toronto are both sadly deficient in this respect. The sooner steps are taken to procure the necessary park property, the better it will be for the taxpayers, as the cost of land in central localities is increasing very rapidly.

**T**HE Dominion Trades and Labor Congress will ask Government to declare that eight hours shall constitute a day's work. One prominent delegate to the recent convention expressed the hope that they would ultimately get the public educated up to the point of recognizing six hours as a fair day's work. If our observation is not astray, there are not a few "labor representatives" who secretly cherish the hope that eventually they will get paid for doing nothing.

**I**T was somewhat amusing to read in the daily papers a fortnight ago that in anticipation of the crowd of visitors to the Toronto Industrial Exhibition, the Building Inspector was determined to enforce the by-law limiting the amount of space on

the public thoroughfares which may be occupied by materials for use in buildings under construction. It is a well-known fact that the provisions of the law in regard to this matter have been disregarded in a great many instances, and this gives rise to the question, why is not the law enforced at all times, instead of only at Exhibition time? The convenience of the citizens of Toronto and those who pay the city taxes are surely entitled to as much consideration as those of residents of other places who pay Toronto a visit once a year.

**T**HE St. Johns, Que., *News* says: "We want waterworks badly in this little factory town, and any company who will undertake to supply the same will find the investment a profitable one. Nature has done her share of the work. Copious springs are located on Pine Hill." If the natural sources of water supply are so advantageously at hand, and profitable results so certain, why do the citizens of St. John fold their hands and wait for some outsider to come along and make money out of the enterprise? Why does not the corporation build a system of waterworks, and apply the profits to reducing municipal taxation? If there is an opening for an individual to make money, there should be an equal chance for the municipality. We have more than once pointed out this fact, together with the advantages arising from the ownership and control of the water supply being vested in the municipality instead in of the hands of a private company.

**T**HE growth of the electric bell business in Canada during the past few years has been truly surprising, and the manufacturers of the ordinary door bells have felt the opposition so keenly that they have been putting forth all their efforts to produce a bell that would resemble the electric bell as much as possible, both in appearance and tone, and at the same time be sold at a low price. The latest result of these efforts is a clockwork bell intended to be placed on the inside of the door and wound up by turning the gong around. A mechanical push button is placed on the outside of the door, and on being pressed releases the clockwork in the bell, which produces a vibrating ring much similar to the electric bell. This imitation is all very well as far as it goes, but it costs more than the electric bell, is more liable to get out of order, and besides the bell and push button have to be placed close together, so that the new arrangement is at the best only adapted to certain circumstances which seldom exist.

**A**FTER a series of changes and delays covering a period of several years, the work of erecting the new municipal buildings for the city of Toronto and county of York, has at last been commenced. It is to be hoped the period of delay is ended, and that this important undertaking will now be pushed straight through to completion in as short a time as may be necessary to ensure good workmanship. We share in the regret expressed by the Mayor that a competent commission was not appointed to superintend the work. We still believe that the appointment of such a commission would have proved an economical step in



the interests of the property owners. Should the erection of these buildings proceed expeditiously, economically, and in accordance with the specifications, under the charge of the Court House Committee of the City Council, we shall be delighted to admit that our doubts of their ability to carry the work to a satisfactory completion were ill-founded. In the meantime, the ratepayers having by their votes declared that no commission shall be appointed, we can only hope that time will justify the wisdom of their decision.

HE lacks discretion and a correct appreciation of the value of human life who goes in search of a gas leak with a lighted match. The last man whom we would suspect of adopting such a fool-hardy method would be a plumber; yet we learn that this is exactly what a Montreal plumber recently distinguished himself by doing. After the gaspipes had been placed in a new block of stores and dwellings owned by G. W. Stephenson, St. Catherine street, a smell of gas became noticeable. The plumber in question undertook to find the leak in the manner stated. When he applied the match to the spot from which the central gaselier was to be hung, the whole ceiling suddenly took fire, and a terrific explosion followed, throwing the plumber violently from the ladder to the floor. Fortunately he received no serious injury. A large portion of the ceiling was thrown to the floor and the plate glass window in the front was thrown into the street in a thousand atoms. Three men employed in the store and three carpenters were in the place at the time, and, while some of them were thrown to the floor and partly covered with *debris*, they were so fortunate as to escape without any injury except a few scratches and bruises.

WE should like to see the Toronto Industrial Exhibition Association offer a series of prizes next year for competition among Canadian skilled workmen. It is a matter of regret that at present no reward is held out in any direction to the Canadian artisan for excellence of workmanship. At the exhibitions held in Toronto, and in other cities and towns throughout the country, the prizes are all for the manufacturer, none for the workman. The workman, whose skill secures the prize, must be content to remain continually in the background, while his employer receives all the credit with the accompanying financial benefits. We cannot but regard this as an unfortunate condition of things for both employer and employee. So long as it is allowed to continue, it can scarcely cause surprise that only a very small proportion of our workmen attain to a high degree of skill. Aside from the prospect of securing higher wages, there is nothing to stimulate their ambition to excel in their respective callings. That some higher object of ambition should be placed before them, all will admit. Public recognition and encouragement of the artisan classes would provide manufacturers and employers with a more plentiful supply of skilled labor, and maintain the efficiency of our national industries in competition with those of other countries. This subject is already receiving attention in England and the United States, and Canada cannot afford to lag behind.

SOME Toronto architects have recently adopted the practice of nailing upon the buildings which they are constructing notice boards with their name and address conspicuously painted thereon. It may interest these gentlemen to know what the London *Builder* thinks of the practice. Our English contemporary says:—"It is one which all those who care about the honor and dignity of the architectural profession ought to do their best to oppose and put a stop to. Some of those who put out these tradesmen's advertisements, of course, are mere hangers on at the skirts of the profession; but it is done by others who ought to know better and to have more sense of dignity and professional propriety. There is no other liberal profession in which this kind of thing would be done. What would be thought if, when straw laid down in the street gives the outward sign of a serious case of illness, a board were fixed up on the house with the notice—'Case attended by Dr. Forceps, 200 Harley street'? We venture to think that if any medical man were so regardless

of his own dignity as to do this, he would very soon find public opinion within his own profession too strong for him. And why does not public opinion within the architectural profession put down this vulgar and undignified form of touting? We should like to know what the Council of the Institute of Architects think of members of the Institute who degrade the status of the profession in that way? And if they do think pretty strongly about it (as we should imagine,) will they tell these advertising gentlemen what they think."

IN criticising the terms of the Hamilton Public Library Building Competition in the May number of this journal, we made this statement: "The value of building material and labor in Hamilton must be only one-half what they are in other places if the sum of \$20,000 is sufficient for the erection of the building. On the dimensions given the building will cube about 400,000 cubic feet, which, at 5 cents per cubic foot, would give \$20,000, the proposed cost of the building. We believe that we are well within the mark when we state that 10 cents per cubic foot will no more than cover the cost of such a building, and then there will be nothing spent on ornamentation." The soundness of this opinion is justified by the tenders which have been sent in, the lowest of which amounts to between thirty-three and thirty-four thousand dollars. This is exclusive of architects' fees, \$1,500, and furniture, \$2,000. The committee now find themselves face to face with a deficit of \$13,000, and are compelled to go back to the city Council for further assistance, while the architect will probably be asked to alter his design with the object of reducing the cost of construction. The Building Committee who have thus walked into a difficulty with open eyes, are deserving of little sympathy. They ought to have known better. It is to be hoped that the blunder they have made will serve as a warning to building committees in the future not to make themselves ridiculous by asking architects to attempt the impossible. If fine buildings are required, funds for their erection must be provided on a liberal scale. So long as the funds are meagre, those charged with their disbursement must be satisfied with unpretentious buildings.

M. R. A. M. WELLINGTON'S scheme for the improvement of the Toronto Esplanade has been submitted to the Board of Trade of that city and to the public through the medium of the daily papers. It has received a flattering reception. The daily press speaks of it in terms of unqualified praise, and appears to believe that it is as nearly applicable to the requirements as anything which could be devised. The citizens' organization formed to watch the interests of the citizens of Toronto on the Esplanade, has yet to be heard from. Many have refrained from expressing an opinion until the report of the experts appointed by the City Council shall have been given to the public. We do not propose at the present time to consider at length the adaptability of Mr. Wellington's scheme. We differ, however, from those journals which seem to regard it as perfect. In our judgment, it certainly is not the best arrangement for the purpose. Under it the improvement of the water front will extend no farther west than Simcoe street. West of that the water front is to be shut off from the city by railway freight yards. The proposal to convert a large area on the Esplanade, opposite the center of the business portion of the city, into a public park, is not a commendable one. The Esplanade property now occupied by the railway tracks should be utilized so that it may be made to yield a revenue to the city which would go towards paying interest on the cost of the improvements. The fact that no provision is made for this purpose, is a weak point in Mr. Wellington's scheme. The proposed park might be more advantageously located elsewhere. What is more required on the water front, is a promenade. The scheme submitted by Mr. Wellington contains little that is original, its main outlines having been presented to the citizens before, while in many of its details it is open to serious objection. However, it is valuable in the sense of being a help to the solution of what is certainly an important and difficult problem.



THE close of the contractors' "busy season" is approaching, and the hope returns that during the coming winter months steps will be taken to organize a Canadian Association of Builders and Contractors, with the object of remedying the many evils which have crept into the business. These evils, many of which were pointed out in the series of articles on this subject published recently in the CANADIAN ARCHITECT AND BUILDER, have so affected the business, that it is scarcely possible any longer for those engaged in it to secure a living profit. When competition has been carried to this pitch in other lines of business, the men whose interests are affected usually adopt the common-sense view that they are acting the fool's part in cutting one another's throats for the benefit of the public, and proceed to organize for mutual protection. There is ample evidence to prove that the majority of Canadian contractors are doing work at unremunerative figures. A very large number of them are doing even worse than this—absolutely working for nothing, or at a loss. This is a suicidal policy which must end disastrously to all who pursue it. If an association were formed embracing the best men in the ranks of the master builders, the members of which should pledge themselves to refrain from cutting prices to an unprofitable extent, the inferior men who are prepared to sacrifice everything in order to secure a contract, might very well be left to the task of devouring one another and making way for a better order of things. The correspondence on this subject from various towns and cities throughout the province which was published in this journal several months ago, proved conclusively the existence of the evil to which we have referred and a number of others scarcely less damaging, as well as a desire on the part of many master builders for an association to deal with them. The opinion seems to prevail, however, that the initiative should be taken by Toronto men, as representing the largest city in the Province. This is a reasonable view, but we regret to state that thus far Toronto builders have manifested much less interest in the matter than those of other places. Their careless attitude cannot be accounted for on the ground that they do not suffer from the abuses referred to, for we can bear personal testimony to the fact that nowhere have these abuses pressed more heavily than on the shoulders of Toronto contractors. We trust that in a matter affecting so vitally the contractor's pocket, the legarthy of the past will soon give way to determination to adopt intelligent means to secure the fair rewards of honest effort. Our columns will be at all times open for the discussion of this subject.

THE Dominion Trades and Labor Congress, at its recent meeting in Montreal, discussed the subject of technical education. Its views thereon are embodied in the following resolution: "That this congress, while favoring a judicious system of technical education, considers that the system of manual training in our schools, such as proposed by the Minister of Education in Ontario, is prejudicial to the interest and welfare of mechanics and wage earners generally." The discussion which took place on the above resolution shows that the proposal to introduce a system of manual training in the public schools is opposed by the representatives of the unions through fear that it might add to the competition in the labor market, and that some of the "botches" which it is claimed such a system would produce may supplant some of the skilled union laborers. One delegate is reported to have said that "The element he most feared was the theoretical mechanic, who, having friends and influence, crowded practical mechanics out in the cold." Could anything be more absurd than such a method of reasoning? It is a well known fact that a botch cannot do the work of a skillful mechanic, and that a theorist cannot fill the place of a mechanic trained in the school of practical experience. Yet here we have the spectacle of men calling themselves practical, skilled mechanics, acknowledging themselves afraid of the competition of a lot of botches and theorists. Surely such men show but little confidence in their own mechanical ability, and will have no cause to complain if employers of skilled labor take them at their own estimate.

The tenor of the discussion throughout clearly showed that the

delegates to the Congress misunderstood the objects of the system of training which the Minister of Education proposes to introduce. It is not the intention, we believe, to attempt to teach trades in the public schools. Such a proposal would be impracticable in the short period which a boy usually devotes to acquiring an elementary education in the public school. The purpose of the Minister of Education, as we understand it, is simply to make the pupil familiar with the underlying principles of mechanical law, provide means by which he may become acquainted with the purpose for which different tools are used, and perhaps acquire a certain amount of adaptability in their use. This we believe to be the very outside limit to which such a system of instruction could be carried in the public schools, and the effect of it would be to give the boy who intends to learn a trade a start under more advantageous circumstances than at present. It can readily be seen that a boy who enters the workshop possessed of such a preparatory training, will make more rapid progress and ultimately develop into a more intelligent and competent workman, than the lad who commences to learn a trade without any knowledge whatever of mechanical theory, and is compelled to grope for years in the dark before finding out the why and wherefore of things. The youth who would be most benefitted by such a course of instruction would be the sons of mechanics, who are in many instances without the means to pursue a University course and enter the ranks of the over-crowded professions. In view of this, the opposition of those professing to speak on behalf of skilled labor, seems singularly ill-advised and ungrateful. It would be interesting to have a definition of the "judicious system of technical education" favored by the Trades and Labor Congress.

#### AN ERROR CORRECTED.

IN the CANADIAN ARCHITECT AND BUILDER for August the statement appeared that the Government had accepted the plans of Mr. Alex. White, of Woodstock, for the new drill shed at Brantford. We presume the information was obtained from one of the Brantford papers, its manifest incorrectness being unfortunately overlooked. Mr. H. James, chief architect of the Militia Department, writes us on the subject as follows: "I notice a paragraph in your paper for August re the Brantford drill shed which is entirely incorrect. Mr. Fred. White of this office took my preliminary plans of this building to Brantford for the inspection of the officers and citizens interested, and I am now busy preparing the drawings necessary to obtain tenders, which I expect will enable the work to be commenced about a month from now."

#### "CANADIAN ARCHITECT AND BUILDER" SERIES OF PRIZE COMPETITIONS.

THE announcement was made in the August number of this journal of our intention to institute a series of prize competitions, the details of which were to have been published this month.

After giving the matter further consideration, we have decided to elaborate a series of competitions which shall extend over a period of six months or more, and prove a source of interest and profit to our readers throughout the coming year. As the architects' offices are yet crowded with work, and the time of students consequently fully occupied, full details of the entire series of competitions will be held over for publication in our October number.

In the meantime, however, we invite competitive plans for a serving pantry, 100 square feet in size, showing cupboards, shelving, etc., with details of same. For the best design sent in, a prize of \$5 will be paid, and for the second best design, one year's subscription to the CANADIAN ARCHITECT AND BUILDER.

Drawings must be made on sheets of heavy white paper or bristol board, 14 x 20 inches in size, and must be drawn to allow of their being reduced to one-half the above size. Drawings must be made in firm, strong lines, with pen and black ink. No color or brush work will be allowed.

Each drawing must be marked with the *nom de plume* of its



author, and the author's name, *nom de plume* and full address, enclosed in sealed envelope, must accompany each drawing sent in.

All drawings must reach the office of the CANADIAN ARCHITECT AND BUILDER, 14 King St. West, Toronto, on or before the 1st day of November next.

We reserve the right to publish any design sent in.

A committee appointed by the Architectural Guild of Toronto will decide the merits of the various designs.

Drawings will be returned to their authors within a reasonable time after the committee has given its decision.

### OUR ILLUSTRATIONS.

HOUSE FOR MR. J. H. BENNET, BARRIE.—EDWARDS & WEBSTER, ARCHITECTS, TORONTO.

THE materials are red brick with shingle gables and roof. On the ground floor are a large square hall, a drawing room, dining room, "den" and kitchen. The first floor contains a sewing room, opening on the balcony, and four bed rooms and a bath room. Three of the bed rooms average 14 ft x 16 ft. The attic can be utilized for three more bed rooms of good size and a store room. Hot water heating and the latest improvements in sanitary plumbing.

SUMMER CLUB HOUSE FOR THE "ROYAL NOVA SCOTIA YACHT SQUADRON," HALIFAX.—MESSRS. EDWARDS & WEBSTER, ARCHITECTS, TORONTO.

This little building, though intended for summer use only, is very substantially built. The material is frame on a foundation of brick piers. The exterior walls are covered with stained shingles laid in straight lines  $3\frac{1}{2}$  inches to the weather. This gives a more quiet and architectural effect than where the shingles are cut as has been the fashion of late years. The color of the walls is a brick red, and that of the roof sea-green. The trimmings are yellow and green, and the window sash white. Inside the walls are lined with clear pine and varnished.

The entrance faces the street, and as the view is taken from the water front, very little of the porch is seen in the sketch. The club room occupies two-thirds of the first floor of the building and opens on the balcony. There is a large brick fireplace with built-in seats, etc. The windows of this room are filled with amber tinted, wrinkled glass. There is also a Secretary's office and a locker room on this floor. The ground floor contains lavatories and one large store room. The janitor is well provided for in the attic.

MEASURED DRAWINGS COMPETITION OF THE TORONTO ARCHITECTURAL GUILD—"THE EASTERN ENTRANCE OF TORONTO UNIVERSITY,"—PRIZE DRAWING BY MR. E. WILBY, TORONTO.

### MANUAL TRAINING.

THE subject of industrial education has been brought prominently before the public by the opening last week of a Manual Training School in connection with Woodstock College, at Woodstock, Ont. During the last six years many such schools have been established in various parts of the States, notably in New York City, Philadelphia, Cincinnati, Cleveland, Toledo, Chicago, St. Louis and New Orleans. These schools are all more or less intimately connected with high schools or colleges in which the student receives training during part of the day in the ordinary branches of a liberal education.

A brief description of the Woodstock School, the first to be established in Canada, will undoubtedly be of interest to our readers. A brick building, two and a half stories high, 32 by 80 ft., thoroughly lighted, has been erected. On the first floor is a ten horse power gas engine, connected with suitable line shafting to drive a combination planer, moulder and matcher, a combination rip and cross-cut circular saw, a large 20 inch wood lathe and a scroll saw, in the wood turning department; a scroll lathe, a planer, an emery wheel and a milling machine, with gear cutting attachments, in the iron working department; a forge and anvil in the blacksmith department, to which many more will be

added as soon as the first class reach that stage in their course. On the second floor are benches and very complete kits of carpenters' tools, for a class of twenty. During the winter a dozen wood lathes will be fitted up. A roomy attic is used for storage.

Regularly the class will spend the day until three p.m. in the college class rooms, and from three to five in the Manual Training School. They begin with carpentry, proceed to wood turning, wood carving, forging, and machine work, through a four years' course. From the beginning, drawing will form an important feature of the course. Every piece of work attempted, be it small or large, must be fully and accurately drawn to scale. No expectation of deriving any revenue from the sale of manufactured articles is entertained. The object is to utilize tools, machinery and material in the education of the practical side of the boy. In the morning the pupil is discussing the theoretical side, in the afternoon the practical; in the morning he investigates principles in the abstract, in the afternoon he applies those principles to the concrete, the wood, stone or metal.

The object is not to teach a *trade*, but to give an all round and practical education. At the same time the pupil will gain some degree of dexterity in the use of both wood-working and iron-working tools, some considerable ability to express any thought by means of the draughtsman's pencil, and to interpret drawings, a fair knowledge of woods and metals, which will be of the greatest value to him in after life. Should he afterwards enter a factory, his intelligence and knowledge of principles would soon advance him from the bench to the position of foreman, and from the position of foreman to that of master. Brains are in demand in our shops.

Persons wishing further information about the manual training department of Woodstock College will obtain it by addressing the Principal, W. H. Huston, M. A., or N. Wolverton, B. A., the Superintendent of the Manual Training Course.

### RIGHTS OF ARCHITECTS.

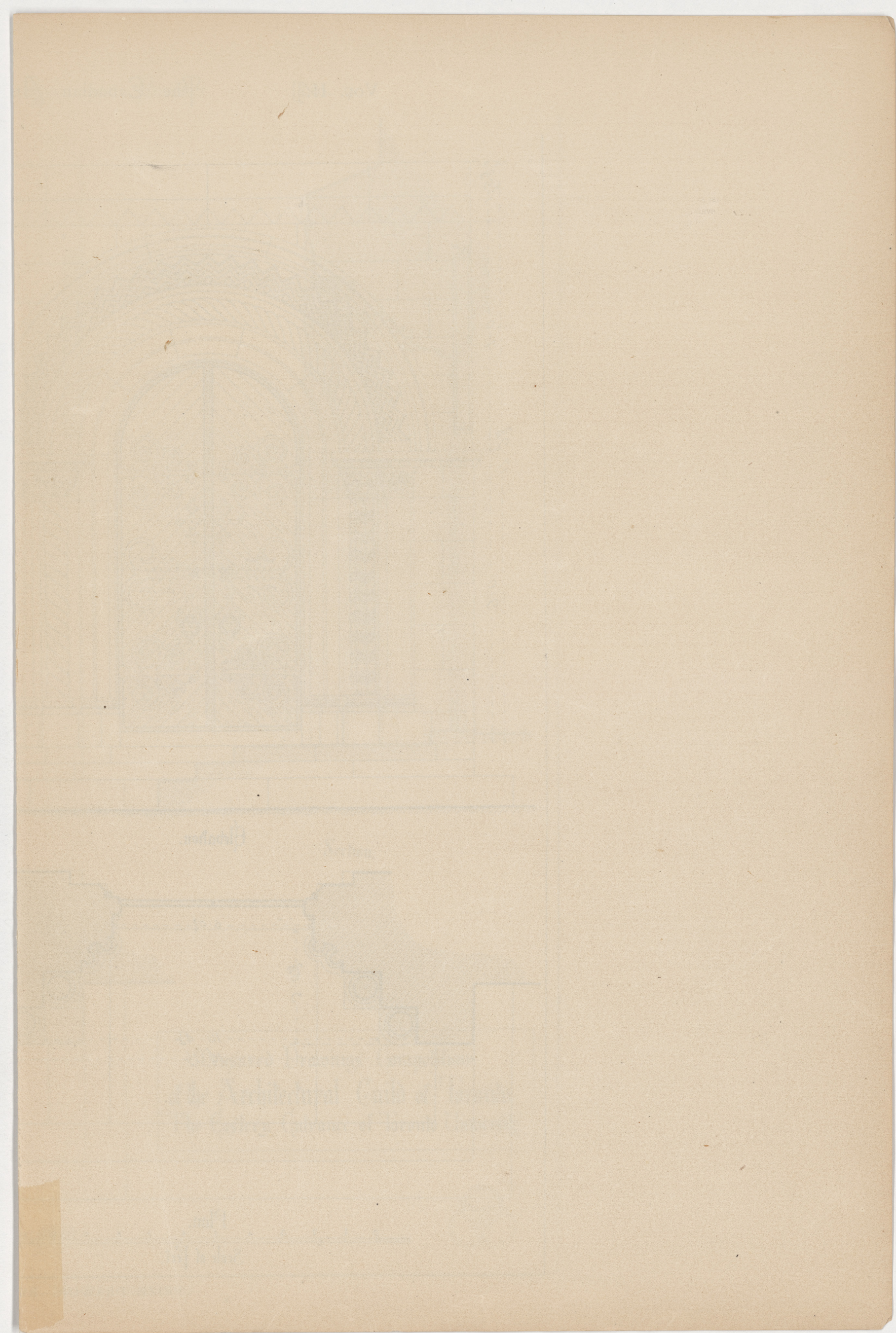
AT the International Congress of Architects, Rouen, the Secretary M. Lucas, introduced the following, defining the rights of the profession:

1. The architect ought to possess the same right of controlling the reproduction or copying of his architectural work that is possessed by the painter, the sculptor and all other artists.
2. The architect, like every other artist, should reserve to himself the exclusive right to reproduce, or authorize the reproduction of his work; and any law which might be made in favor of the protection of any artist, should apply to the architect.
3. Any architect who had conceived a plan of an edifice or directed its erection should have the right to inscribe upon it his name and profession.

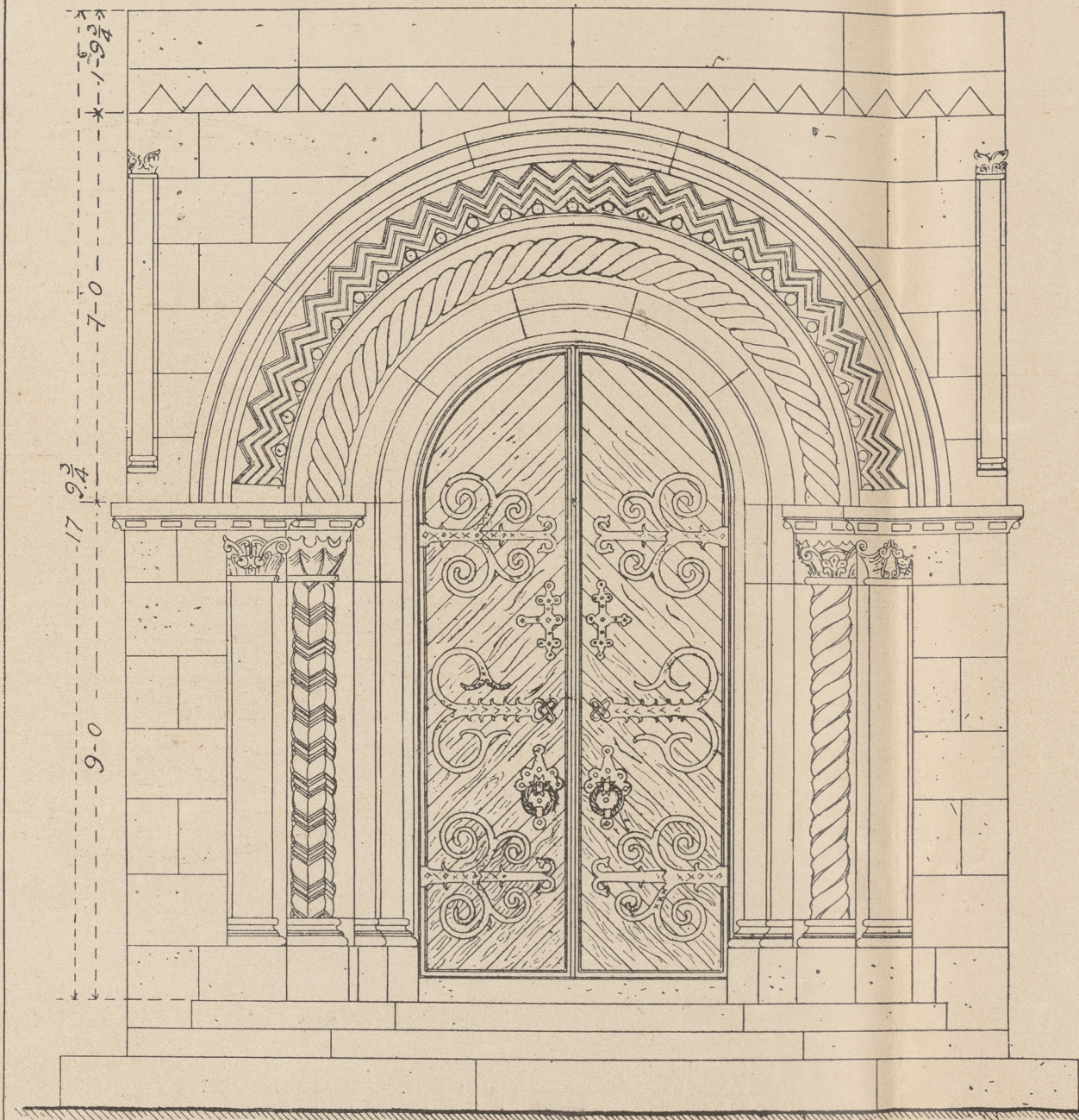
### BRICK FOR STREET PAVEMENT.

A CORRESPONDENT of *Science* states that about 50 towns in the United States use brick for paving the streets, and some have used it for as long as 15 years. Common building brick is quite unfit for the purpose, as it soon shows the effects of wear, but good hard brick always gives satisfaction. No paving material is equal to it except granite blocks, and it costs only a third of the latter. The most suitable bricks are those made from the common yellow joint clay, having a large percentage of silicate and iron. The laying of a brick pavement, the writer says, is a simple matter. The foundation being brought to the proper grade, there is spread over it 6 in. of gravel or sand, which is struck off with a board gauge fitted for the grade of the street. A course of brick is then laid on the flat surface, running lengthways along the streets. It is not necessary that this should be as hard as the upper course. Over this an inch of screened sand is spread, gauged, and properly smoothed off. The top course is then laid with the bricks on their edges lengthways across the street, the joints being broken in both courses. The whole is covered with an inch of screened sand, which is swept into the crevices. A roller weighing five or six tons is then passed over the pavement several times, and if this is properly done the pavement will be as smooth as one of wood, and almost as noiseless. The street must be drained, as the lasting qualities of the brick and the even surface of the street depend greatly on the drainage. The upper course should be very hard and of vitrified brick. Horses do not slip or fall on brick pavements, owing to the small surface between the seams. If water and frost are kept out of brick the pavement is almost indestructible.

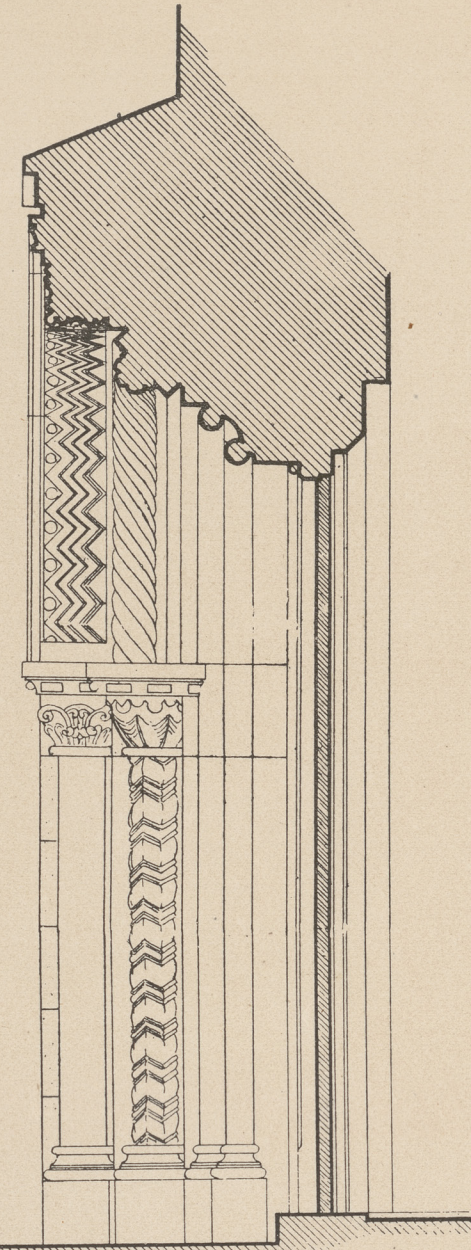




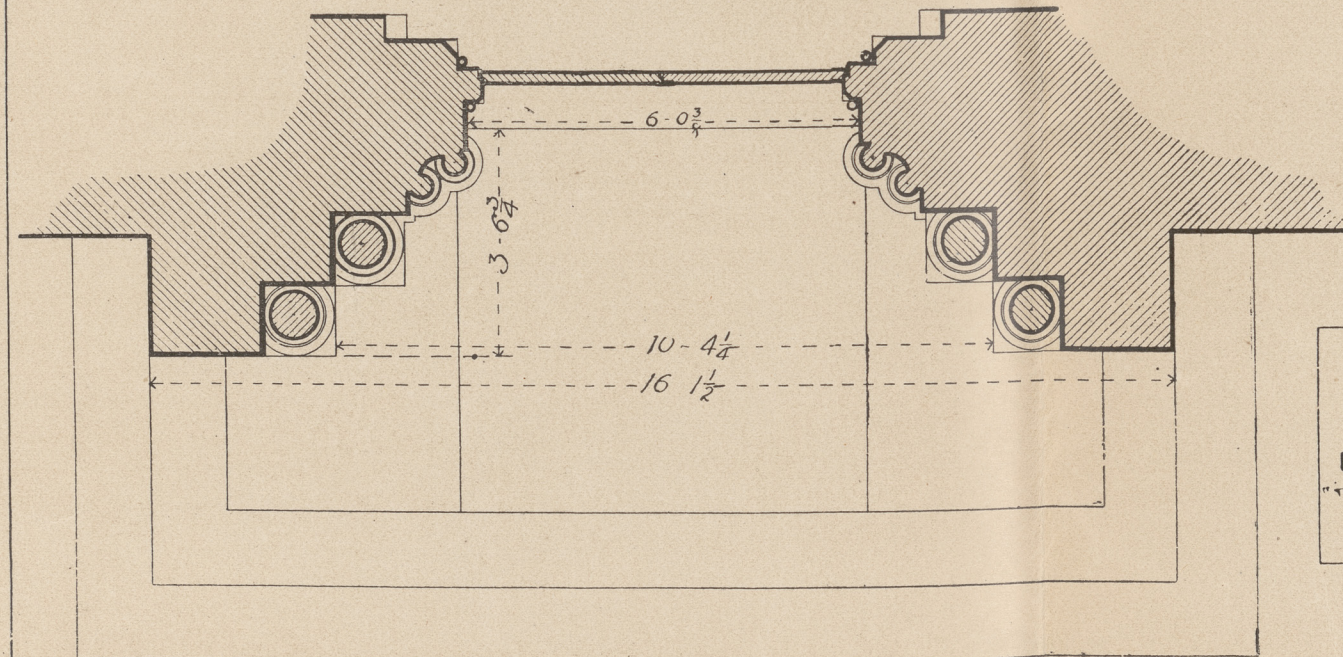




Elevation.



Section.

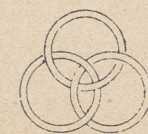


Plan.

0 1 2 3 4 5 6 7 8 9 10 11 12 Feet

Scale of Feet.

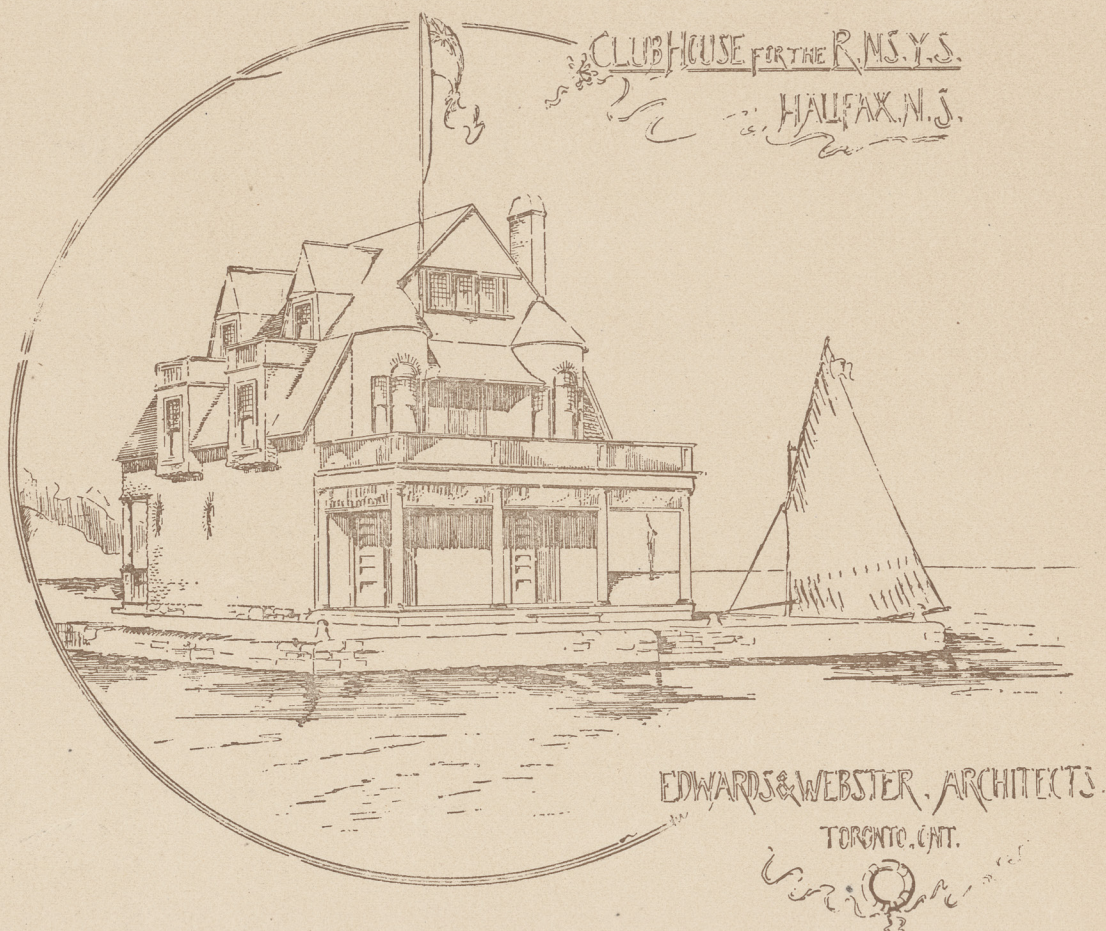
Measured Drawings Competition  
of the Architectural Guild of Toronto.  
"The Eastern Entrance of Toronto University"





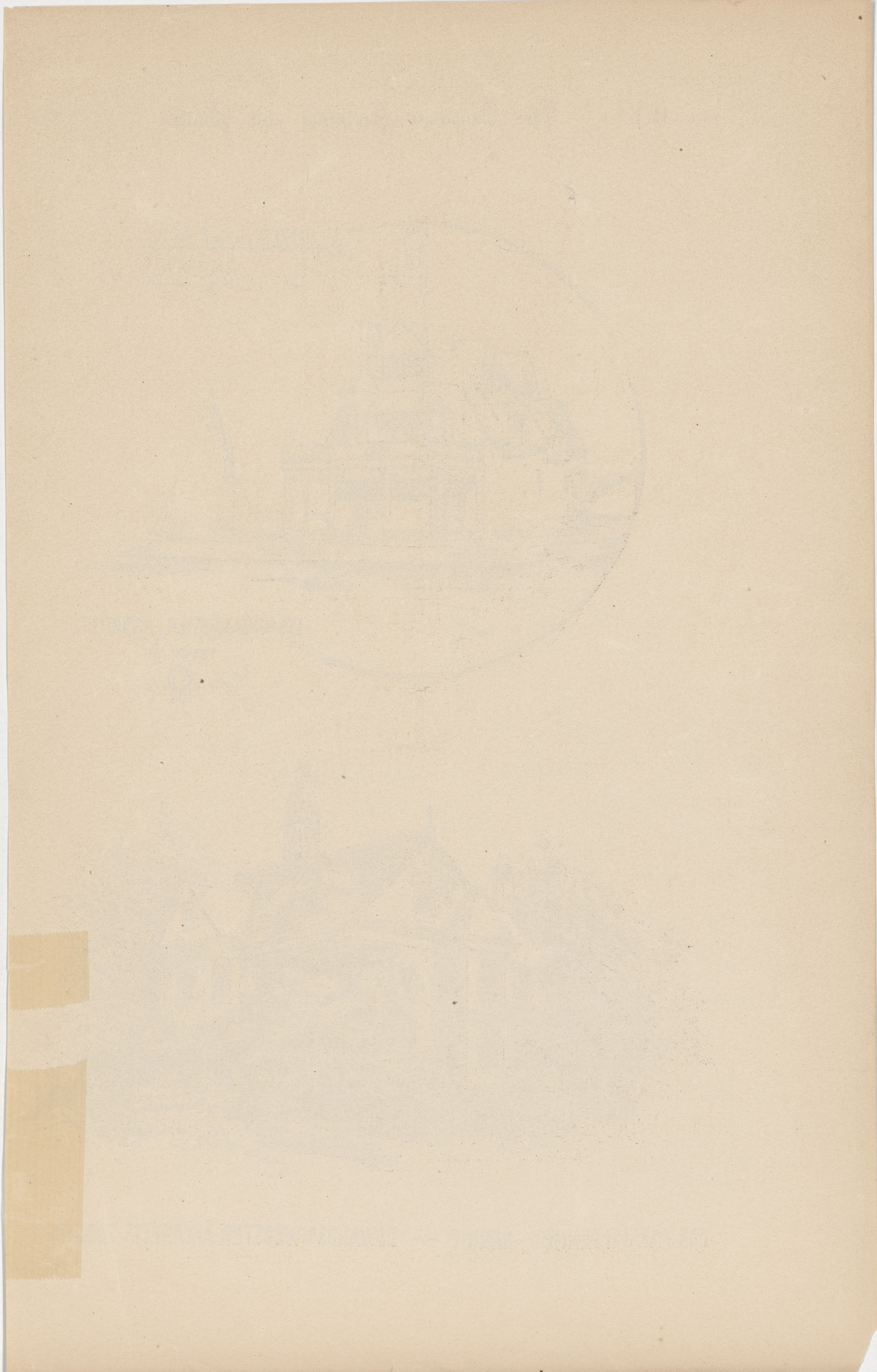
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FOR MR. J. H. BENNETT BARRIE — EDWARDS & WEBSTER, ARCHITECTS, TORONTO







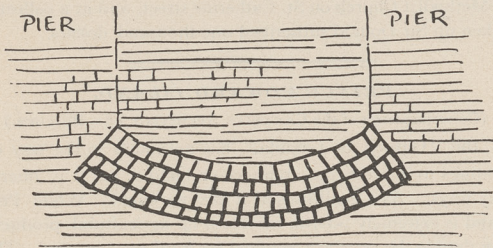
## THE "INVERTED ARCH."

TORONTO, August 20th, 1889.

Editor CANADIAN ARCHITECT AND BUILDER.

DEAR SIR,—Will you kindly give me a little information on the subject of "inverted arches?" As an amateur, I have been rather taken with the principle of this feature of construction, but my ideas on the subject received a rude shaking up recently when, in passing along Front street, at the north west corner of Front and Yonge, I came upon the basement walls of some rather large looking building that possibly you may have noticed some time, and which a little boy informed me was for the Board of Trade.

You must excuse me if you find it difficult to understand me, because your technical terms are rather hard for an amateur to remember, but I will try and describe as briefly as possible what I saw. There were some big upright piles of brickwork measuring about 7 feet in front. I suppose you would call them "piers" very likely, and these things were about 7 feet apart. Well, between these, low down, was, and I suppose is, for that matter, the "inverted arch," which, according to my preconceived notions, ought to distribute a certain amount of the weight of the piers along the foundation. "Well," thinks I to myself, "devil-a-bit of weight will those things distribute," and then it occurred to me that perhaps I was wrong and the arches right, and when a workman told me that the architect was from some place in the States, and his name was Jimmy somebody, I for-



get what, I thought it would be to my peace of mind to find out from someone likely to know, whether I was right or wrong in my ideas. Now I heard of your paper through a friend, and he told me you knew all about this kind of thing, and that if I wrote to ask you, you would give me an answer in your next month's paper. I shall look out for it, I can tell you, for either I am wrong or else that blessed building will be very weak on its pins.

Now these arches, Mr. Editor, are made of (if I remember rightly) about four thicknesses of half bricks, rather loose, with about an inch between each brick, filled up with what I took for mortar. The arch goes right through the wall, of course, from front to back, or back to front, I am not sure which way you would say, and then funnily enough, upon the upper curve of the arch which, poetically speaking, I may call its "bosom," stood a pile of brickwork filling up between the two piers. I'll get my son to try and draw the thing as it is, and then as I thought it ought to be, for I'm blessed if I don't think I'm right after all. Well, as I looked at the thing, I said to myself, if that mortar was to take it into its head to get squeezed out from between the brick-ends by reason of the brickwork above pressing down upon it, the part of the pier on the arch at each side will go down about two inches, while the middle of the pier which does not touch the arch will stand where it is put; and all that brickwork lying in the "bosom" of the arch will only help to add to the discomfort of the poor crushed arch bricks, which, if it was not for the brickwork below, would certainly give way under it. As I was told that the drawings for all this work came from the architect perhaps this is the American way.

This, which is coming now, is the way I thought it ought to be done in. To stop the pressure of the piers the arch ought to be in some way proportioned to the width of the piers, and the joints ought to be very fine so that there might be no squeezable stuff, only the hard bricks, and for this cement would be better than mortar. If the arch only supports a narrow bit of the pier on each side, the rest of the pier must be standing on the foundation, and part of each pier would then be on a different foundation to the other part, which I was thinking was not the object of the arch. I was

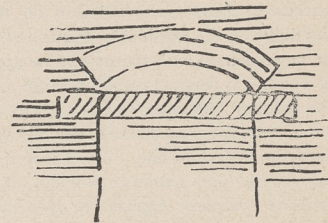
told once by an engineer,—I don't mean the driver of an engine but the man that, so to speak, drove the men that drove the engine, or drove the men that made the engine (something like that his work was)—well, he told me, that if it was not for the gravity of the bricks, that was, he said, the drawing of them towards the earth, one might build piers with an arch at the top and an inverted arch at the bottom, right up in the air off the ground, because you see the weight of one pier comes down to the arch, runs round it and goes up the other pier, and the weight of the other pier counter-

balances it, and so there's no weight at all in this method of construction. I could not understand that, and I told him that if it was not for the gravity of the bricks he spoke of, I should have thought them uncommonly risible things; but perhaps you will know what he meant.

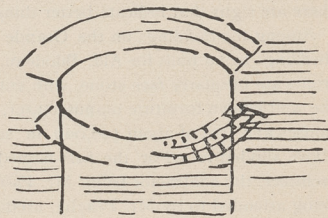
If one wanted very much to pile on the bricks between the piers, would it not be better to make them stand on a good thick stone, or on another arch turned right way up leaving a round or oval space between, according

to the form of the arch? Well as to the thickness of the arch, or the number of half brick or brick rims, that depends on the width of the pier on "face," and the length of the "skew-backs" (is not that what you call them?) together should in my humble opinion be made to balance the width of the centre part of the pier—that is, I mean, they should bear in their length a relation similar to that borne by the width of the pier to the width of the space.

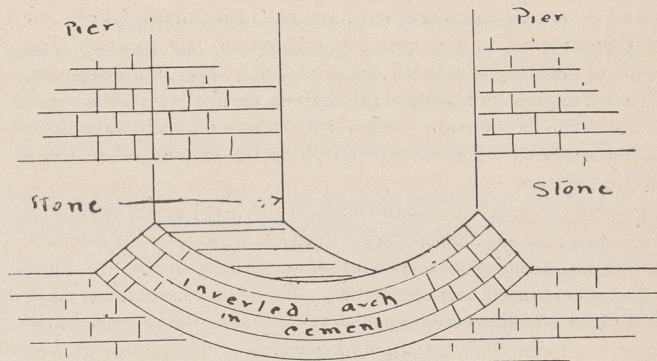
Another point which is of importance I should have thought, would be the equalizing of the weight of the piers as much as possible, and a good way to bring this about is to put a stone as my son has shown in this sketch at the foot of the piers against which the skew-backs of the arch would abut. You see by this means, the pressure of each pier would be conveyed by the arch to the next pier, and along the stone to the next arch, and so on all along the building; but of course, each pier having an equal weight, the pressure of the pier mentioned would meet the other, and would be stopped and counterbalanced by the other. Now then you will see my point without your glasses—if the arch is made in mortar and with wide joints, with the weight of half of each of the piers on each side of it, that mortar is going to have a bad time. It will be squeezed out and the bricks will close together and the piers will move. I should have said that my stone ought to be pretty thick from top to bottom, because otherwise I should think it would be likely to crack from the lower part of the "skew-back" upwards,



THIS WAY.



OR BETTER STILL. THIS WAY.



Please tell me what you think of my son's drawings at the same time. He calls the last one a "perspective view" and that shows how the stone above the "skew-backs" goes right through the wall, like the arch, which is what I wanted you to understand.

I hope you will be able to find time to write me an answer, and waiting for it, I am,

Yours truly,

AMATEUR.

[Answer. We are very pleased to tell you that your suggestions as to the construction of the inverted arch are quite correct, and you are right in your opinion of its importance and its functions. The inverted arch is a dangerous thing to play with, because unless it is constructed with the greatest care, it is worse than useless—it becomes a trap. Many men employ it, and it looks simple enough, and so it is, but to those who do not understand its principle and make use of a clumsy substitute for it, it is a delusion and a snare; in fact what they think is an inverted arch is nothing of the kind and will never answer its purpose. We are sorry to hear that the arches at the particular building you mention have been roughly put in, but as it is all covered up now and out of sight, we have been unable to see them for ourselves and we hope the architects noticed the defects and had them remedied. But the proof of the pudding, you know, is in the eating. When the piers are built up, if the arch is not strong enough to support them, defects will very soon appear. Do not be disappointed when we say that we can hardly give a fair opinion of your son's draughtsmanship from the few specimens before us, but if he will call and show us some more of his own work we shall be pleased to tell you what we think of them.—THE EDITOR.]

According to *Indian Engineering* the tensile strength of a rope is only one third when it is wet of the strength of same rope when dry. When saturated with grease or soap the strength is even less, the lubricants permitting the fibres to slip on one another more readily. Hemp rope contracts greatly when wet, a twenty-five foot rope contracting to 24 feet.



## QUEBEC.

(Correspondence of the CANADIAN ARCHITECT AND BUILDER.)

THE building trade here this season is more active than usual, and in consequence the wages of mechanics have reached very unusual figures for this locality. First-class bricklayers are now being paid \$4.25 per day; masons, \$2.25; stone cutters \$2.50; joiners, \$1.60 to \$1.75, etc.

Our main boulevard, the Grande Allee, is being very much improved by the erection of several fine residences, which, added to those put up during the last 10 years, makes the road one of which any city might feel proud. Its present condition, with its liberal width, (75 feet), its fine wood block pavement, the elegant residences on the south side and the Parliament buildings on the north side, forms a striking contrast to the wretched street of 20 years ago, with the serpentine approach to the old St. Louis gate, all of which was deemed necessary from a military point of view. In place of the old gate there now stands a graceful erection in castellated style with a stone arch spanning the roadway, above which the ramparts are continued across in unbroken line. The effect at night under the brilliant light of our electric light system is excellent, and causes old citizens who return to visit the "ancient capital" to open their eyes, as it is a standing belief that we are always retrograding. "Just like Quebec," unfortunately is held to express one's idea of all that is slow and non-progressive. Happily there are signs that indicate better things in the future.

Among the buildings on the Grande Allee above alluded to, are four dwellings being built for Ald. Bilodeau, at a cost of about \$25,000. The fronts are of quarry face stone, with cut stone trimmings. Mr. P. Valliere, the well known furniture manufacturer, is also building a terrace of four houses at a cost of about \$20,000 in somewhat the same style as those above alluded to. For the first-named terrace Mr. Elz Charest is the architect, the contractor being Mr. Paul Breton; Mr. Valliere's terrace is being attended to by Mr. Peachy, architect, the contractors being Messrs. Paradis & Cote.

The last front portions of lots to widen this thoroughfare on the south side have been expropriated, and corporation men are now laying the balance of the wood block paving, as designed by Mr. C. Baillarge, City Engineer.

## MONTREAL.

(Correspondence of the CANADIAN ARCHITECT AND BUILDER.)

AUGUST, as usual, is rather a dull month with our architects, at least in so far as new work is concerned, as most of our clients seem rather inclined to get away from the dusty city and breathe the pure salt air of "The Gulf." We expect, however, that the crops generally having proved much better than was at first anticipated, the fall trade will be fully up to the average.

It is rumored that Duncan McIntyre, of Canadian Pacific Railway fame, contemplates erecting a private residence in Montreal this autumn that will eclipse anything of the kind in Canada.

Contractors and builders generally are very busy at present, as a large number of contracts have been let during the past few months, and the city has been awarding some heavy contracts for street paving and widening, &c.

## BUILDING PERMITS.

It is right for every city to have a good strict by-law regarding the construction of buildings of all classes within its limits. Montreal has a sort of an apology for one, but it falls far short of the mark in my estimation. Such as it is, it seems very difficult to get an "English" copy of it. One clause of our by-law calls for the owner filling a blank form to be had at the office of the Building Inspector. It requires the description of the site, the class of building to be erected, the thickness of the walls, size and position of joists, rimbeams, columns, piers, the number of stories and the nature of the roofing materials used, etc., name of owner, architect and builder. So far, so good, but what I object to is, that after the owner has complied thus far, and before he can begin to build, he is obliged to get the Inspector's permit and pay a fee of \$2 into the city treasury. Why this should be I cannot understand. It certainly appears a false principle to inflict a fine (for it is nothing else) on the person building as an inducement to conform to the city by-laws. If it were done in a small town, where no other provision was possible to raise the salary of the Inspector, I could understand it. It would be far better policy for the City Council to abolish this fee and issue permits without charge, as I hold it would be more in the interest of the city to encourage builders to take out permits and conform to the by-laws than to harass them in collecting this paltry sum.

## ELECTRIC LIGHTING.

Montreal is determined to be the best lighted city on this side of the Atlantic, and I have no doubt but she will eventually succeed. During the past month the whole city and annexed suburbs have been lighted by electricity. The Gas Company has at last given way to the Royal Electric Lighting Co., who have lost no time in wiring the streets and putting up the necessary stations and machinery to fulfil their contract with the city. Every one prophesied that it would be impossible for the company to light the whole city in the time allowed by the contract, but time has proved the contrary, and at the very hour on the day mentioned the city was instantaneously lit up. Of course, I do not mean that it is perfect in every particular—it would be too much to expect a perfect transformation in such a short time—but it goes without saying that it is a vast improvement on gas.

True it may, and probably does cost more, but it adds greatly to the appearance of the city, and gives one the impression that "it is alive." I will endeavor later on to give you full particulars of the system and details of their plant and buildings, which are I believe the best in America.

## CITY HALL NOTES.

It is now an open secret that the Deputy City Surveyor is very anxious to follow the example of his chief and to get a step ahead of him if possible. He is asking three months leave of absence and a bonus of \$500. It is high time that the tax-payers took hold of this sort of thing and instructed their representatives in Council how to act. I do not object in cases of sickness to allow civic servants rest, but I fail to see why they should be paid a "bonus" in addition to their salary—when we are told at every Council meeting that "there is no money for constructing drains, side walks or pipes for the citizens. If the applicant was an employee who had devoted the best years of his life in the service of the city, it might be pardonable, but now-a-days an official hardly gets into harness in the City Hall, before he wants leave of absence and a bonus—upon what grounds we outsiders fail to see. Perhaps it is because this is the season of the year that we do outside work, and the contractors use their influence to get the engineers a well deserved rest.

## CORNER STONE.

Sir Donald A. Smith, on Saturday last laid the corner stone of the new Douglas Methodist Church on St. Catherine street, and at a collection afterwards taken up Sir Donald subscribed one thousand dollars.

## PRINCE EDWARD ISLAND.

(Correspondence of the CANADIAN ARCHITECT AND BUILDER.)

THIS, the "Garden of Canada," has not much in the way of public buildings to interest the architect or builder, but it is interesting in very many ways. As a health resort it has no equal. While Prince Edward Island is extremely poor in minerals, its agricultural productions are more than double the quantity required for local consumption. The Island is well traversed by roads, and fairly good ones at that. A railway extends its full length, and is, if anything, a little longer than the island itself. The curves are rather "too utterly too too," but this is accounted for by the fact that a bonus of so much per mile was paid by the Government when it was built, and the contractors naturally found it paid better to curve in and out around creeks, &c., than to spend money in building culverts over same.

Engineers are also interested in the Island, from the fact that one of the Island's senators proposes to connect the Island with the main land by means of a sub-marine tube. Extensive surveys with this end in view have already been made, but the scheme has not yet taken any more practical shape. Communication with the mainland is at present kept up by the steamers of the Steam Navigation Co. in summer, and the steamer Stanley, which was expressly built in Scotland for this purpose, in winter, and is giving entire satisfaction, but she has only had one winter's trial so far.

## SHIP BUILDING.

In days gone by ship-building was one of the principal enterprises on the island, as the various shipping registers will show. Of late years, however, this has gradually fallen off. With the exception of the past two years, little or no building was carried on. Your correspondent was fortunate enough to see a launch of very fine barkentine on Saturday last, from the ship-yards of Messrs. J. & J. Richards, of Bideford. I had no idea it would be such an interesting sight, it would puzzle the uninitiated how it could be possible to move such a ponderous mass of wood-work from its stocks in the yard to the waters below, without any machinery or power, but we had not long to wait. The tide was just at its height, and at a given signal, without the least noise save a gentle tap of a mallet the vessel glided gracefully down "the ways" and in less than one minute, was at anchor in the stream. Although it is nothing new to see a launch in this part of the island, yet I think every man, woman and child for miles around was present. Just as the vessel was about to start a bottle of "aqua fortis" was handed Mrs. W. McLea Walbank, of Montreal, who in due and ancient form, named her "The Bonita." The vessel is quite a credit to its builders, is 397 tons register and is classed ten years Ar at Lloyds.

## WINNIPEG.

(Correspondence of the CANADIAN ARCHITECT AND BUILDER.)

ALTHOUGH some of the contractors are complaining of work being slack in the city, and not a great amount in sight for the fall, yet, taking all into consideration, by the end of the year the total quantity of work will make up a good average, which is perhaps quite as much as should be expected, because there is no doubt the city was a little ahead of the province, there being buildings sufficient for the demand.

The N. P. & M. R. have commenced building their \$300,000 hotel and depot, also round house, workshops, &c. Messrs. Rourke & Cass are the contractors who have been awarded the work, and are making that end of the city hum. They have about 700 cords of stone and 1,600,000 bricks to lay before the winter closes in. The hotel building is a very fine imposing structure of 7 stories, faced with St. Louis red bricks, with Bayfield brown stone dressings.

The Deaf and Dumb Asylum for the Government, to cost \$20,000, the new Market Building, costing \$25,000, Messrs. Jas. Robertson & Co.'s new



warehouse, \$15,000, the Electric Light Co.'s power house, \$17,000, Messrs. Ross & Foulds' block, together with other solid brick structures, has created such a demand for native bricks that those unsold now are being held at \$13 per M., which is a rise of \$3.

The outlook for next season is very good for the building trade, as it seems to be understood that American capitalists have determined to back up the energetic policy of the Northern Pacific, and invest largely in this city; in fact for some time past large commissions have been issued to purchase choice lots.

The wheat crop of the country turning out so much better than was anticipated, is another great reason to anticipate good times ahead.

The other towns are being built up faster than Winnipeg in proportion, such as Portage la Prairie, with its Home for Incurables, Torren's titles office, business blocks and numerous private houses; Brandon, with its new post office, reformatory, and very extensive new business blocks and houses; Carberry, Morden, Virden, Boissevain, Deloraine and many others are all coming rapidly to the front, with solid brick and stone churches, banks, business blocks, &c., so that the summary of the amount of money invested in building this year throughout the province will total up to large figures.

From a professional standpoint, the outlook is also better, as investors are gradually realizing the fact that there is something in having even the plainest material fixed artistically, and no matter how honest and well intentioned a contractor, he is only human; and in the absence of competition and superintendence, is very apt to get larger prices for badly executed work than is the case when an architect is employed. Principals are now alive to the fact that by paying a trained professional man, they get a good return for their money.

### HOW TO ESTIMATE.

By "CATO."

NO deduction is usually made for the over-lapping of corners in figuring the cost of digging trenches for foundations, as the extra labor involved in making then covers the decrease in the quantity to be excavated.

When making up the cost of clearing a mounded site, or one which has stuff accumulated above the ground or street level, a more difficult method than those described must be worked out, to determine as near as possible the exact amount to be removed and its cubical contents. Should the contractor be called upon to tender for cleaning and excavating a site and cellar, either of rock or other stuff, he can find the solid content of it as follows:

27)25402½(966¾ cubic yards.

236

180

162

182

162

20

Find the highest point hilly or mounded surface, and take a tape line and measure from this point to the edge or line of the lot. Say that in this case the greatest depth is in the centre of the lot, which is 25 ft x 100 ft. To find the depth, or third side, supposing the tape line to register 54 feet.

54 feet length of hill.

50 feet length to greatest depth.

54 x 54 = 2916.

50 x 50 = 2500.

416 the square root of which, = 20.39, thus,

2)416(20.39

24

4039 1600

1209

39100

36621

479

20.39 depth, or 20 ft. 4 in. at center.

To find area of section:  $100 \times 10 \times 1.6 = 1016\frac{1}{2}$ ;  $1016\frac{1}{2} \times 25$  feet, length of front lot, = 25,402½ cubic feet.

The contents of the rectangular excavation below the street level can be found in the usual manner.

Should the mound or rock be nearly conical, it would be best to treat it as a cone or pyramid, and to find its contents.

Multiply the area of the base, if square, or rectangular, by  $\frac{1}{3}$  the perpendicular height as A B. If the base be found first, find the area by multiplying the square of the radius by 3.1416. Thus if the lot be 25 feet wide,  $12\frac{1}{2} \times 3.1416 = \text{area}$ . Area x  $\frac{1}{3}$  per height of conical hill = contents in feet. Again, if it be a round or circular heap of boulders then it is judicious to take the top, as of segmental or semicircular section, and figure thus:

Take the girth over the entire surface with a tape line (held loosely), and regarding this as the length of a segmental or semicircular arch, proceed,

taking the ground level as the base or chord, for the former. Having found the rise or depth by leveling from the highest point, divide cube of rise by twice the chord or length of ground level and add to the result  $\frac{2}{3}$  of chord multiplied by rise (or depth).

For the latter:  $(502 \times 3.1416) \div 2 = \text{area of section}$ .

Area x depth = cubical content.

The best way is to find the geometrical figure which the ground resembles in section as well as can be judged with the eye, and to apply the arithmetical rule covering the calculation of the solidity of the figure it resembles.

As all calculations of this kind can only be approximate. I would recommend estimators to allow a sufficient margin to cover contingencies, and if anyone is awarded the contract, to give it out to a contractor accustomed to removing and heavy excavating. It is manifestly unwise to undertake to do a job which is unfamiliar to the estimator.

### BRICK VS. PIPE SEWERS.

IN view of the recent decision of the Toronto Board of Works which did away with pipe sewers of 15-inch and 18-inch diameter, in favor of brick sewers of a very small diameter, it may not be uninteresting to compare the comparative merits of both from various standpoints.

Taking a general view of the matter, it may be said at once, that the action of the Board was surprising to say the least, inasmuch as all modern authorities on the subject are agreed in saying that pipe is preferable up to such diameter as will warrant easy and cheap laying. This limit of size is pretty generally fixed at 24 inches. We hope we shall not be deemed impertinent if we inquire why the limit should have been fixed at a maximum of 12 inches for Toronto. It is beyond doubt that for a city the size of Toronto, a 12 inch street sewer is altogether too small; it is too small to carry off any heavy flow of water during wet weather, and too small to give the stagnant or slow running sewage a suitable amount of ventilation or rather oxidation which it is necessary that it should have to make the gases emanating therefrom as nearly innocuous as possible. This one particular point about the diameter of the smaller pipe sewers, has been made the subject of a very able letter, written as we understand by one of our most prominent physicians, the city Medical Health officer. Press of other business has, we presume, prevented that official from giving the matter his immediate attention, but we hope for some decisive action on his part at no distant date.

Without going into any technical considerations concerning the amount of friction to be overcome by sewage in, or the amount of air which should be admitted into the sewer in order to oxidize the sewerage gases, it may be said that pipe sewers are in every way preferable. They are just as durable if not more so than brick; they are cheaper, and from a sanitary point of view they are incomparably more efficient.

In the matter of cost, the experience of the Board as recently acquired shows, that practically a brick sewer costs from 25 to 40 per cent more than a pipe one. If we add to this the fact that most of the contractors who have built these small sewers have lost money on their contracts, and that the sewers built by day labor by the city itself have cost the ratepayers more than those built by contractors, it may fairly be surmised that we have not yet got at the bottom of this business, but that we may have more costly experience to acquire in the near future.

Repairs are much more easily effected in a pipe sewer than in a brick one, and at much less cost. The sewers now about to be put in on Roxborough street, on the property of Messrs. H. O'Brien and W. Nightingale, are a striking example of this. Tenders were asked for this work laid in pipe and also for the same laid in brick. The same contractor was the lowest in both instances, his price for the pipe sewer being \$840, and for the brick sewer \$1,210 odd. In the face of such figures as these, the action of the Board is beyond comment.

A pipe sewer when carefully laid, is practically indestructible. Some few prejudiced or interested parties claim that pipe cannot stand the pressure which it may be subjected to, but we purpose establishing in a subsequent article, that this is an error, both from a practical and from a theoretical point of view.

The main point now to be considered, viz., that of sanitary efficiency, will be found more perfect in the pipe sewers than in the brick. The two main requisites, a free flow of the sewage and its thorough ventilation and oxidation in the sewer, are more completely carried out in the pipe than in the brick sewer. The numerous joints, and unglazed and irregular surface of the brick, make it very hard to obtain a free flow, and in time the worst ingredients of the sewage soak into the brick and form a slimy deposit on its surface. This slimy deposit increases the difficulty in the flow of water, and moreover becomes a source of perpetual danger, as every time the atmospheric pressure is lowered through any change of weather, any quantity of noxious gases arise therefrom.

Any number of figures taken from the records of the Board of Works might be cited here in confirmation of our contention, but lack of space prevents us from giving further particulars on the subject, which we purpose to treat more thoroughly at a future date.

The Stratford Building and Saving Society has been instituted. Nearly \$14,000 was subscribed by the gentlemen present at one of the meetings.





## WOOD CARVING.\*

By T. O. FRAENKEL.

TO begin, a carver must have, on an average, we will say, about fifty tools or chisels, and in order to have somewhere near a complete set, one can have two or three hundred, and still there would be no two alike, as all carving tools are ground at random or hap-hazard, but I have known of carvers executing creditable work with six, and in some cases doing better work than his neighbour with sixty. To do good, clean work it is of the utmost importance to have very sharp tools; without them the work would have the appearance of work done with a nail or hatchet. I had the pleasure of seeing, if you please, work of that kind in this city some years ago. It was at a carving school for ladies. They would toil probably two or three weeks, and in that time execute a masterpiece, with the help of the professor, and then take it home and spring it on their friends as their own handiwork. I am informed that there is a school in Cincinnati where they have more ornament than design. In spreading the tools on the bench, it is customary to lay the tools down with the points toward the operator. This is done (in laying the tools down) to prevent the point from striking the bench where there is more or less sand, which would dull the tools. In beginning a piece of carving the carver should know what position the work is to take, and to know whether it is going below or above the level of the eye. If placed above the eye it should be cut vigorously with rough and effective lines. If the work is placed low or level with the eye, it should be cut smooth and effective. We will take, for example, natural foliage conventionalized. That is to say, we spread the foliage, flowers and stems, departing somewhat from nature in order to get the panel evenly filled up. For instance, we lay out the panel, starting the main stem from the lower left-hand corner, and lay it out the best we know how; in laying out the stems they should be drawn with graceful lines, or, in other words, they should not be drawn in the panel like a string of noodle. In showing the branch from the main stem or intersection of branches, they should be drawn or cut in this manner, and in cutting the foliage it should be cut with quick and sharp curves; it can be cut so and still retain a soft appearance. For an illustration, we will take a leaf laying over a stem in this manner; it is not right to have a leaf clinging to the stem and background. I have seen that mistake made quite frequently, both in drawing and carving. A panel of that description should be laid out without the thought of a background. The shadows will take care of themselves. An experienced workman would turn that leaf up in the opposite direction, in order to avoid that effect and give the stem freedom and the leaf a light and airy appearance. If the panel is below the level of the eye, the leaves and flowers should be face up, and very little of the edge of the leaf shown, and should be undercut to give it a light appearance, the reverse if looked up to. After the design is laid out, the work is set in [a carver's term] roughly, and then grounded out, and then beginning on the surfaces roughed out to the general form striven for. Then the work is set in to the form of the leaves and the surface cut smooth; the ground is leveled as much as possible, and then stamped; it is then gone over with a stiff brush, and the panel is finished. The brush is used to produce a polish on the work, and to take off the newly cut and raw appearance of the wood and to give it the same tone as the newly surfaced margin. Sandpaper should never be used in good work, as it takes out all the life and expression in it. Carving should remain as the tools leave it. Not long ago I saw a finely designed Renaissance panel intended for a parlour mantel. The surface of the ornament was cut as good as any one could expect from a person that would cut the ground in the manner I saw it. The ground was cut rough and jabbed in every way. It looked like a scene in the Rockies, leaving out the poetry, and not a ghost

of a show for the delicate lines or shadows. I think it is wrong to cut the ground in this way; it may possibly do for some Byzantine work where there is little or no ground shown, but I would prefer to see the ground cut on a general level. In the outline form of the leaf, it should be cut bold and clear with little line or vein work on the surface, which jumble the form and outline. Very often you find, where the form of the foliage is entirely neglected and the surface of the leaves so cut up with innumerable lines and stems, that to the eye the form of the leaf is completely destroyed. This, I think, is the fault with some of our Byzantine work. I maintain it should be cut with a soft effect, and it can be cut so and not look limp and lifeless. The number of lines produce a dark tint. Thus you have a mass of shade with innumerable small shadows, but no parts broad enough to receive the necessary amount of light. In our city of smoke, and fog now and then, and very little sunlight, where materials are blackened with smoke and dust, carving should be cut clear, bold and distinct. In carving, the position of ornament should be treated according to the position it is to take, and one should be careful in its use. If out of place it would not look well in a piece of furniture, no matter how well it may be cut. On the other hand, ornament in its proper place should be cut well. Better leave it off entirely if you cannot have it good. When you have a sunk panel with a small margin, always cut the ornament out of the solid, and call for it on the details. In modern cabinet work it is often glued on to save expense. Work of that kind is not exactly objectionable, for good glued work will hold on as well as the solid, but there is always a doubt whether it is glued well. In some cases it is not practical to cut it out of the solid, owing to the difficulty in getting the ground level with the outer surface or margin.

In studying ornament I would advise working from photogravure plates. Printed ornament does not fill the bill, as it does not show the delicate effects on the surface of the foliage. I would suggest Hauptman's Italian Renaissance, as these plates are taken from casts of original models. If one can draw Renaissance it is not difficult to work in any style that presents itself. Keep on with your pen and ink and pencil and water colour, study and observe nature and everything pertaining to art; do not imagine you are not built that way, but go right in with a will and in time you will surprise yourself.

## TREATMENT OF CEILINGS.

THE ceiling is perhaps the part of an apartment that calls most loudly for decoration, says the London *Architect*, and no architectural feature is more susceptible to it, where it might be introduced with more effect, or give more pleasure to the inmate; yet this feature we invariably neglect. We naturally look up for beauty; however lovely the earth, the sky, both night and day, presents us with greater charms; we are cheered in our outdoor hours by its everchanging picture, for which a flat white plane is a miserable substitute in our indoor life. To houses of the very highest class these remarks will apply, for it is a feature which has not had its due proportion of attention, in point of decoration, in any class of buildings, from the cottage to the palace. There certainly can be no more fitting place for decoration in the habitation of a being created upright. Can inconsistency be more extreme than that presented by thousands of apartments, where a rich elaborately decorated carpet is under the feet, and a plain, dead, flat ceiling above? In the interior of Arabian buildings the ornaments almost invariably become richer, more delicate and minute, as their height from the floor increases, and the most exquisite productions of the artist are lavished on the ceiling. With respect to the form, the curve is at all times preferable to the flat, though the latter by various means is capable of great beauty also. No very great additional height is required in order to have a curved ceiling, as, whether coved or segmental, the rise need not be very great. For rooms of great pretension there is no form more noble and natural than the vault and dome, particularly the latter, whether hemispherical or segmental, as far as it suits the plan or can be adopted by pendentives or otherwise. It is the best substitute

\* Abstract of paper read before the Chicago Architectural Sketch Club.



for the blue vault of the sky, the starry concave of the heavens. It was a fine idea of the builders of the mosque of St. Sophia at Constantinople—a conception in advance of ours—to make the curve of its dome so flat that it should seem to correspond with that of the sky, and be a portion of the firmament. We want an enlarged, improved, enriched, and at the same time inexpensive system of interior decoration, for domestic and ecclesiastical, and other buildings, in our anglo-classic style.

For churches, collegiate and other buildings in the pointed style, we have examples in our cathedrals and other buildings, which prove that the genius of interior decoration was once among us, as well as the taste to employ it. At Henry the Seventh and King's College Chapels; the Oratory at Beauchamp Chapel; the Temple Church; Wolsey's Hall, Hampton Court; Christ Church Hall, Oxford; Westminster Hall, and others, we have ceilings and roofs that might vie with any that Europe could show. For assistance in evolving a system of Classic decorations we might look to some parts of the Continent. Exterior decoration there has sometimes probably been carried too far, a few Continental edifices exhibiting ornaments so minute and fragile as to seem at least unfit for exposure to the weather in any climate. But this could not be said of interiors. The Moorish or Morisco-Spanish architecture suggests to us what richness might be produced by very simple means; their icicle pendants, inlays, and casings, and purely geometrical and imaginative ornaments, are very effective, and with them they often produce greater results than we, with all nature to imitate, have attained to. But the art of interior decoration was better understood and more successfully practiced in the great age of modern art in Italy, and indeed throughout the Middle Ages than at present in any country. We never had any decoration to be compared with the mural and fresco paintings of the Italians, and there is probability in the supposition that their system was obtained from the remains of the ancients, which time or violence has not spared to us. Beside the curved and richly emblazoned ceilings produced by the Italians, and the pictorial embellishment of their walls, ours might symbolize poverty itself. The ceilings of the principal apartments of a Roman, Genoese, Venetian, or Florentine palace were considered as most important features, and on their design and execution the highest talent was employed. In ecclesiastical buildings the contrast with ours would be still greater. Whilst the interior of the churches of Italy glow with every rich hue of the marble quarry, and are virtually galleries of art, what is the aspect of ours?

#### ELECTRICAL PLUMBERS.

THE *Engineering Record* says: "A new class of craftsmen have sprung up all over the country within the past six or seven years who bid fair to become scientific artisans, in their line, on account of the practical knowledge necessary in the business.

"They are known as the 'electrical' or 'special' plumbers. Their duties are to weld the joints of subway cables, and to do this successfully they must not only be first-class plumbers, but intelligent workmen, who can learn something about electricity and the necessity of perfect insulation of circuits. Few people who have watched the placing of underground cables can appreciate the important part the electrical plumber plays in the matter. Each year he becomes better known, and, it is safe to say, he will continue to increase in numbers and in prosperity. The salary of an electrical plumber is about \$5 a day.

Letters patent are being sought at Ottawa incorporating the National Construction Co., of Yarmouth, N. S., for the purpose of acquiring railways, tramways, wharves, etc., and also for the construction of houses and other buildings. The capital is to be \$5,000,000.

We are in receipt of the first number of *The Builders' Exchange*, which is henceforth to be published monthly in Boston as the official journal of the National Association of Builders of the United States. The editor is Mr. W. H. Sayward, the capable Secretary of the above Association, to whom we extend the right hand of journalistic fellowship.



#### SUBURBAN SANITATION.

QUITE often in the designing of suburban residences, where there is no proper sewerage system, say G. C. Kaufman in the *Building Advertiser*, the architect meets with a very vexing problem, that of disposing of the sewage and rain so as to attain a good standard of sanitation; and again, to have the sewerage construction as cheap and practicable as possible.

The first matter to be noted is the fall of the land surrounding the residence to be constructed and the character of the soil. The soil should slope from all sides of the foundation so as to make fall enough for the rainfall to drain from the walls. In climates where the rainfall is very large for a given time, a method more effective than the foregoing should be employed—one that is more direct in its action, so as to carry away from the foundations the copious flow of surface water. The method most practicable is to dig trenches in the direction of the fall of the soil, about eighteen inches wide, and not more than two feet below the floor line of the cellar or basement. The trenches should not be less than twenty feet in length and running or radiating with not more than twenty feet apart at their sources.

Fill the trenches to a depth of two feet with coarse gravel and broken stone; fill the remainder of the trench with soil well packed down. By doing this you have a complete system of channels leading from the house, and all surface water which sinks downward will reach these channels and be conducted from the foundation walls and soil surrounding the residence.

This should be an important matter to the owner and should not be looked upon as an unnecessary expense, but on the contrary as one of the main features for health and comfort.

There can be noticed in many basements and cellars a blackening of the first-story beams with incipient decay, or a chilly atmosphere with a peculiar and penetrating smell, especially after rains. Such are the houses where people die of consumption and other lung diseases; or the churches that you enter with a sudden depressive feeling and leave with a cold or headache. There is an abundance of such homes and buildings where the sickness of the inmates is directly or indirectly caused by the gross negligence of the owners in this one important feature.

Dampness about the house should at all times be avoided, as it is one of the chief constituents in the growth of bacteria and other unhealthful and poisonous germs of disease. Let the architect in all cases arrange the drainage as near to perfection as possible and refuse to allow any but absolute security against water or dampness within the foundation walls.

There are many other methods of drainage which are more costly and complicated, but which serve to the same end. By this simple method the rainfall sinks to the gravel in the trenches and finds an easy escape, thereby leaving the cellar and foundation dry and healthful.

Having mentioned the chief features and advantages of the proper drainage of the area in question one would naturally turn to the house problem—the disposal of sewage.

There are a great many systems devised and advocated. Some are very costly, while others are defective in some measure. The best plan, and one which has been adopted both on a small and large scale, is the surface irrigation of the sewage; that is, the removing and disposing of it by means of pipes, so laid as to leave the matter in the undersurface. The sun, soil and air are the principles of action in this plan, together with a series of receiving tanks which perform the operations of settling and intermittent flushing.

The flushing tank should be as simple as possible and not have a complicated mass of pipes and mechanism, which is liable to become rusted or choked up with matter. The best and most effective design for a flushing arrangement is a series of these tanks—the receiving or settling tank, the flushing tank and a final discharge tank, which contains the siphon connect-



ing with the flushing tank. The receiving tank should be made large enough to contain about one-third of the probable discharge of sewage for one day; that is, up to the overflow to the flushing tank, which should be about two-thirds up the side of the tank and have an inlet extend downward below the water line. The same direction applies to the house discharge to the receiving tank.

As the sewage rises up in the receiver to the overflow it then discharges in the flushing tank as it comes in access in the receiver. The flush tank is connected then at the base with the discharge tank, by means of a siphon, the neck of which rises up to the mean water line of the receiver and flush tank. As soon as the siphon is filled to the mean level the sewage gradually drips over until a siphon is produced, and then the sewage rushes out in the discharge tank and to the main pipe and its various branches, thereby causing a complete evacuation of the flush tank. This process is again brought about as soon as the flush tank is filled again. By constructing the three tanks to suit the discharge per diem, one can have a thorough flushing of the system three or more times per day.

The main pipe leading from the discharge tank should have tight joints, but its branches should be two inch terra-cotta tile laid with open joints, so as to allow the sewage to sink away as it passes through the different branches.

The tile should be laid not less than twelve inches below the surface, and have a fall of not less than one foot in fifty. The different branches should be laid about five feet apart.

#### THE SIZE OF REGISTER TO USE.

REGARDING the sizes of registers and pipes for different sized rooms, the following is taken from the catalogue of a prominent furnace company: In public halls or buildings where but a single register is required, take the hot air pipes from the top of the furnace and use register without valves. The size of pipes and registers requisite for the successful operation of any furnace is a matter requiring the best judgment, and should be determined by the size, position, and distance from the furnace of the spaces to be heated and cannot be governed by any fixed rule. We usually recommend for rooms of ordinary height as follows:

Room on first floor, 12 x 14 feet, should have 8 inch pipe with 8 x 12 register.

Room on first floor, 12 x 18 feet, should have 9-inch pipe with 9 x 12 register.

Room on first floor, 16 x 20 feet, should have 10-inch pipe with 10 x 14 register.

Room on second floor, 8 x 12 feet, should have 7-inch pipe with 8 x 10 register.

Room on second floor, 10 x 16 feet, should have 8-inch pipe with 9 x 12 register.

Room on second floor, 12 x 16 feet, should have 9-inch pipe with 10 x 14 register. Medium size halls should have 10-inch pipe with 10 x 14 register. Large size halls should have 12-inch pipe with 12 x 15 register.

When oval or flat pipes are built in the walls of an ordinary three or four story city house, the basement room and parlors should have independent pipes; second, third and fourth story rooms can be warmed by a single line of pipe reduced in size over each register, viz:

A house 18 or 20 x 45 or 50 should have a separate pipe, 4 x 16 to basement.

A house 18 or 20 x 45 or 50 should have a separate pipe, 4 x 16 to each parlor.

A house 18 or 20 x 45 or 50 should have one line, 4 x 18 to second story, reduced to 4 x 14 for third story, reduced to 4 x 9 for fourth story.

A house, three storys, 20 x 45 or 50 should have one line, 4 x 16 to second story, reduced to 4 x 9 for third story.

The above sizes to be varied according to the size of house and general division of the interior space.

4 x 24 pipe in the wall should have 12-inch pipe connected with furnace.

4 x 20 pipe in the wall should have 10-inch pipe connected with furnace.

## MANUFACTURES AND MATERIALS

### ENDURANCE OF WOOD POSTS IN FIRES.

THE contents of a building, says E. M. Shaw, in the *Architect*, (London,) have undoubtedly much to do with its safety or danger, but in estimating the whole risk, the materials of which the building is constructed must never be put out of consideration. Every building cannot be erected with brick column and groined arches, but there is a vast range between these and the miserable cast iron pots too commonly to be seen, many of which have been put in without having been tested for strength even at the ordinary temperature of the atmosphere, much less at that of a fire. The following illustration may be given of a fact well-known to all firemen of experience, but seldom proved to demonstration for those not specially interested.

A fire occurred in a warehouse of enormous proportions and raged with great fury for five hours, at the end of which time it was extinguished, and a very large proportion of the building and its contents saved. The warehouse was constructed of brick walls; it had wooden floors supported on wooden beams, which in their turn were carried on wooden story posts about 12 inches thick, and, although serious damage was done, not one portion of the heavy wood-work was destroyed. After the fire, the proprietors allowed the chief of the fire brigade to remove one of the story posts, with a section of the beams and other parts surrounding it above and below.

This post had been subjected to the full action of the fire during the whole of its duration, as already mentioned, or, making full allowance for everything, including the delay of the fire attacking the particular spot on which it stood, and the time at which the cooling process commenced, certainly not less than four and a half hours. As large quantities of water had been used, and it was probable that everything had been saturated, the wood was carefully dried before a strong fire until not a trace of moisture remained in it. It was then set on end in an open yard, exactly as it had stood in the warehouse, with the pedestal underneath, the cap above, and the beam across the cap, more than a ton of shavings, light wood and heavy wood were placed around it, and after the whole heap was saturated with petroleum, a light was applied to it, and after this, large quantities of petroleum and turpentine were pumped on it. At the end of two and a half hours the post, beam and other parts were withdrawn from the fire, and within a few minutes from the time they were withdrawn they ceased to burn. A few feet were then sawn off horizontally, at that part which had suffered most from the flames, and afterward the same piece was split longitudinally with steel wedges, in order to examine its condition.

The post was of pitch pine, about the most inflammable wood known, and yet after exposure for seven hours to fire, the fury of which could not be exceeded except in blast furnaces, it contained within a quantity of perfectly uninjured and apparently fresh wood, probably capable of supporting the whole weight which the original post was designed to carry. Immediately after the saw cut, and again after the cleaving with steel wedges, the centre was carefully examined, and found to be just perceptibly warm to the touch, but nothing more, thus proving that the fibre, in which the strength lay, was quite uninjured.

### PUBLICATIONS.

OUR thanks are due to Messrs. Merchant & Co., of Philadelphia, for a series of handsome photogravure plates showing perspective and sectional views of the celebrated Eiffel tower at Paris, made from photographs taken during Mr. Merchant's recent visit to the Paris Exposition.

We have received from the publisher, Mr. M. T. Richardson, New York, a copy of his book entitled "Practical Blacksmithing." Notwithstanding the fact that every village and hamlet in the civilized world contains a blacksmith, and has ever since mankind learned the various uses of iron and steel, nobody has ever written a book on the art of blacksmithing. A chapter has now and then appeared in works on mechanics, but these comprise the extent of the world's printed knowledge of an art without which mankind would relapse into barbarism. The present work is a compilation of practical articles which have appeared during the last ten years in the columns of *The Blacksmith and Wheelwright*. Ancient blacksmithing and primitive tools are considered briefly, and then plans of shops, chimney building, forges, and descriptions of a great variety of tools are given. The illustrations are numerous, and the book would appear to be of great value to all workers of iron.

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## CONTRACTS

### CONTRACTS AWARDED.

GALT, ONT.—The Hospital Trust has awarded the contract for building the hospital to Mr. Robert Middlemiss, for the sum of \$5,938.

SHELburne, ONT.—Mr. R. Blain, of Brampton, has secured the contract for supplying and laying the pipes, putting in hydrants, etc., for the waterworks.

PRESTON, ONT.—Mr. Walder has let the contract for his large hotel and sanitarium to Mr. Brown, of Berlin, for the stone and brick work, and plastering, and to Mr. A. McAuslan, Galt, for the carpentering and wood-work.

We desire to correct an error which appeared in connection with the publication of particulars regarding Mr. Beck's house at Penetanguishene, in the CANADIAN ARCHITECT AND BUILDER for August. It was there stated that the carpenter and joiner work was done by Messrs. Bryan Bros. We have since been informed that the firm mentioned had nothing whatever to do with the building, but that the wood-work was done by Mr. Peter C. Hunser, jr., of Collingwood, to whom all credit for excellence of workmanship is due.

### CONTRACTS OPEN.

NAPANEE, ONT.—A system of Waterworks is to be put in.

SHAWVILLE, ONT.—A Baptist Church is to be erected here.

LEAMINGTON, ONT.—The Methodists will build a \$12,000 church.

MAGOG, QUE.—It is proposed to erect a new town hall and market buildings.

MIAMI, MAN.—The Methodists and Presbyterians have each decided to build a church here.

MONTREAL, QUE.—An appropriation of \$4,000 has been made for the enlargement of St. James market.

LONDON, ONT.—The Public School Board has decided to expend \$10,000 in building an addition to the Collegiate Institute.

VANCOUVER, B. C.—Mr. S. C. Burris, architect, has prepared plans for a \$15,000 stone residence to be erected for Dr. Hamington at his farm at Aldermere.

GALT, ONT.—The Board of Trade will ask the Council to submit to the ratepayers the question of constructing a system of water-works at a cost of \$100,000.

HAMILTON, ONT.—The Sisters of St. Joseph have purchased Bishop Dowling's residence on John St., and will remodel it to serve the purposes of a hospital.

KINGSTON, ONT.—It is proposed to build a double house for the accommodation of the Church of England Bishop and the rector of St. George's Church. The cost is estimated at \$12,000.

CRAIGIELEE, MAN.—The Presbyterians propose building a church at an early date.

BEAVERTON, ONT.—It is reported that the G. T. R. intend building a new station.

OWEN SOUND, ONT.—The Secretary of the Public Works Department at Ottawa, will receive tenders until the 18th inst., for proposed improvements to be made to the harbor at this port. For particulars see advertisement in this paper.

OTTAWA, ONT.—Plans have been prepared in the office of the Chief Architect of the Militia Department for officers' quarters for "C" Battery at Victoria, B. C. Tenders for the work of construction will be invited by the Public Works Department.

GALT, ONT.—The tenders sent in for the erection of the new hospital being in excess of the funds at the disposal of the directors, the architect has been instructed to amend the plans with a view to reducing the cost, and new tenders will be called for.

WOODSTOCK, N. B.—Plans and specifications for a new stand-pipe have been prepared. It will be 35 feet in diameter by 40 feet high, and may be erected this fall. In connection with its erection 1,400 ft. of 10-inch pipe will be required, with the necessary valves, etc.

TORONTO, ONT.—The following building permits have been granted by the City Commissioner since the date of our last issue: Chas. Furringer, pair s. d. 3 storey brick dwellings, Homeward Ave., cost \$3,250; J. C. Hurst, pair s. d. 2 story and attic brick dwellings, Berkley, near Gerrard St., cost \$5,000; J. J. Follett, det. 2 storey and attic brick dwelling, corner Bloor and Huntley Sts., cost \$10,000; A. Coleman, det. 2 story and attic brick dwelling, 49 Alexander St., cost \$3,700; Mr. Creighton, pair 2 story and attic brick dwellings, Dunn Ave., cost \$5,000; Dr. W. T. Aikins, det. 2 story and attic brick dwellings, Jarvis and Gerrard Sts., cost \$8,000; Dr. E. J. Barrick, alterations and additions dwelling corner College and Markham Sts., cost \$1,000; W. W. Mason, 2 pair s. d. and one det. 2 story and attic brick dwellings, Melbourne and Gwynne Ave., cost \$15,000; Toronto Incandescent Light Co., E. L. Station, Terauley St., cost \$20,000; Hon. S. C. Wood, alterations to dwelling, Avenue road, cost \$2,000; A. Smith, 4 story brick veterinary college, Temperance St., cost \$16,000; E. S. Rickford, additions at 36 Front St., and 27 Wellington St., cost \$7,000; S. F. McKinnon, 5 story brick and stone bank and offices, Yonge and Colborne Sts., cost \$6,000; P. Lankin, two 4 story brick warehouses, Bay and Front Sts., cost \$40,000; A. W. Godson, pair s. d. 2 story and attic brick dwellings, Richmond St., west of Duncan St., cost \$6,300; Mrs. Kerr, 2 pair s. d. 2 story and attic brick dwellings, Jarvis St., north of Queen, cost \$6,000; John Taylor, 3 story brick cigar factory, Richmond near Jarvis St., cost \$4,000; Mrs. Buchanan, 2 story and attic detached brick dwelling, George St., south of Lowther Ave., cost \$11,500.

### PERSONAL.

Mr. Thomas Eddy, of the Toronto Stone Co., and a well known and highly respected contractor, died very suddenly while attending a meeting to consider the erection of a new Methodist church at Kingsville, Ont.

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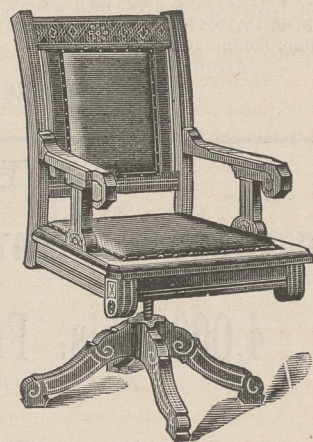
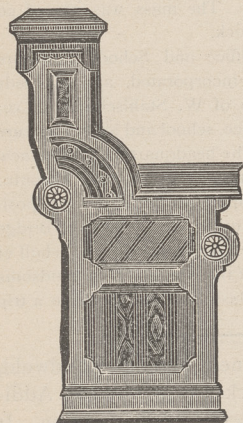
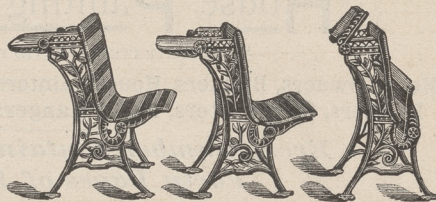
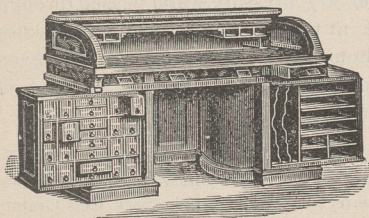
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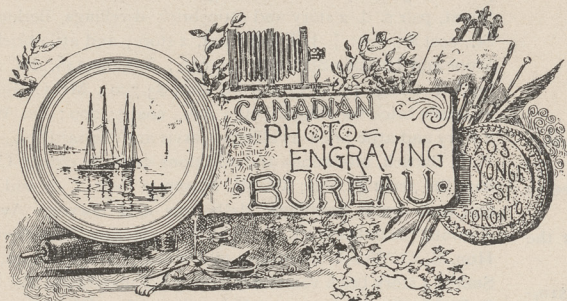
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**THE PERMEABILITY OF CEMENTS AND MORTARS.**

**T**HE question of permeability of cements and mortars has been treated of by the Board of Experts appointed to report on the Washington Aqueduct Tunnel. In their report it is stated, says *Engineering*, that even if the brick lining of the tunnel were carefully made and backed, still leakage could not be prevented, as bricks are themselves pervious under somewhat moderate heads. In some experiments made by Mr. Francis last year, about 13.8 gallons of water per square foot of surface passed through a thickness of nearly 16 inches cement in twenty-four hours, under a pressure of 77 pounds per square inch. Mr. Stauffer, another engineer, constructed a bulkhead of brick-work in cement, in the Dorchester Bay Tunnel, which measures 10 feet by 10 feet, under a pressure of 72  $\frac{1}{2}$  per square inch, water percolated through at the rate of 96,000 gallons per day. Experience on the Boston main drainage work showed that it was not practicable to build a brick bulkhead which should be tight for pressures exceeding 64  $\frac{1}{2}$  per square inch, and at the Croton Reservoir water under 36 feet head water was found to percolate through 26 inches of brick work and four feet of concrete. In some experiments made by the Board of Experts themselves, a good fair specimen brick was exposed to a pressure of 80  $\frac{1}{2}$  per square inch on one of its faces, and under these conditions 23.4 cubic inches of water passed through the brick in the first hour, and 21.3 in the second hour. The mean of these figures is equivalent to 1.4 gallons per square foot of surface per hour. In the case of another brick under the same pressure 46.8 cubic inches passed through in one hour. Blocks of cement mortar allowed to set for twenty-four hours in air and afterwards hardened for five weeks in water were also tested. Under 80  $\frac{1}{2}$  pressure, water passed through these at the rate of 36.4 gallons of water per hour. The above figures have been reduced to English gallons of 10  $\frac{1}{2}$  of water.

What is said to be the largest block of granite ever quarried in New Brunswick was taken from the quarry of the New Brunswick Red Granite Company, near St. George, a few days ago. It weighed 1,200 tons. The mass was moved 20 feet from the solid rock.

The Canadian Office and School Furniture Company has been incorporated, and succeeds the well known firm of W. Stahlschmidt & Co., manufacturers of office, school and lodge furniture at Preston, Ont. The headquarters of the new Company will be at 24 Front St. west, Toronto.

Mr. H. D. Bush upon retiring from the position of superintendent of the Dominion Bridge Co. at Lachine, Que., was presented on behalf of the 300 employees of the works with a handsome gold watch. Mr. Bush is about to make a trip to Europe.

The beautiful new hotel at Childwold, in the Adirondacks, owned by Mr. Addison Child, is attracting great attention. It is finished completely with Creosote stains, the colors being soft and harmonious.